WP 4a - Management of environment and natural resources

Economic and climate change pressures on biodiversity in southern Mediterranean coastal areas

Laura Onofri, Paulo A.L.D. Nunes and Francesco Bosello

MEDPRO Technical Report No. 24/February 2013

Abstract

This paper establishes and measures key biodiversity and ecosystem health indicators and the number of world heritage sites in coastal areas at global level. It then estimates – econometrically – the indicators' influence on the provision of tourism values through the marine ecosystem function as a harbour of biodiversity, and as a provider of amenity values and marine cultural identity. The report then focuses on the MEDPRO region, providing some estimates of the potential impact of climate change on these services for a given temperature increase scenario. Finally, the effect on ecosystem-related tourism is computed for the four MEDPRO social economic scenarios. The analysis is enriched by some quantification of the potential costs of adaptation.

Keywords: Coastal tourism, 3SLS, marine ecosystems, cultural values, climate change impacts, cost of adaptation.

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1. Introduction and background

The study of tourist industries requires a heuristic approach. From the economic perspective, however, two main streams of research have emerged that are relevant to the study of tourism industries: i) research aimed at understanding the relationship between economic growth and tourism specialisation in selected countries; and, ii) research aimed at understanding the determinants that explain tourists' choice and demand.

In the first stream of literature, the relationship between tourism specialisation and economic growth is becoming one of the principal areas of research in the growing field of tourism economics. Since the seminal works of Copeland (1991), Hazari & Sgrò (1995) and Lanza & Pigliaru (1995), the role played by tourism in the process of national development has increasingly captured the attention of both academics and policy-makers. In the last few years, many papers have attempted, mainly theoretically, to understand the underlying mechanisms at play that determine tourism-related economic development, but many shadows prevent light from being shed on this issue. Notable empirical papers include the works of Brau, Lanza & Pigliaru (2004 and 2007), and Lanza, Markandya & Pigliaru (2005).

In the second stream of literature a significant number of studies aims to elucidate the variables affecting tourists' destination choice and the elasticity of touristic demand to price or income changes – see Candela & Figini (2004) for a comprehensive survey. In particular, the practice of 'sea and sun tourism' in coastal areas is a relatively recent phenomenon, with this type of economic behaviour being registered during the second half of the 19th century among the élite and, after World War II among broader groups of population.[1] Before this 'tourism revolution', coastal cities and areas were territories principally exploited for fishing and other maritime economic activities. The main driving force behind tourism development in coastal areas was travel for health reasons. Other variables shown to affect the choice of a coastal tourist destination include income, cost of services, distance and cost of transportation and exchange rates (Dritsakis, 2004; Witt & Witt 1995; Hamilton et al., 2005; Bigano et al., 2007; Lise & Tol, 2002). Resident population density and tourist population density can also affect the destination choice. It is has been documented that some consumers prefer crowded destinations; others enjoy locations 'far from the madding crowd'. Fads and fashions also affect destination choice (see Candela & Figini).

Economic variables such as income, tourism prices, cost of transportation and exchange rates are therefore widely used as explanatory variables to account for tourist arrivals. In addition, the GDP of the country of destination may also be a driver of flows, based on the idea that the growth of international tourism tends to concentrate on regions with the highest level of economic development (Hamilton, 2004; Hamilton, 2005a; Eugenio-Martín et al., 2004). Furthermore, population density has also been shown to affect international tourism through a proportional increase in departures. In this respect, Hamilton points out the ambiguous interpretation of the impact of population density on tourism flows, since tourists may be attracted to densely populated countries with a larger number of

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[1] Since the Second World War, the growth of international tourism has been exponential. Annual tourist arrivals worldwide increased from 25 million in 1950 to 940 million in 2010.

towns and cities with associated tourist facilities and infrastructure. On the other hand, areas of high population density and therefore few or no natural unspoilt areas may be unattractive to other tourists. More recently, empirical studies have focused their attention on the econometric analysis of the relationship between climate and tourism demand. Temperature is typically considered as the most relevant climatic variable, since most climate parameters, such as humidity, cloud cover and weather extremes are ultimately linked to temperature and climate change might shift international tourists towards higher altitudes and latitudes in the future (see Lise & Tol (2002); Hamilton et al. (2005a and b); Bigano et al., 2007).

Furthermore, several studies consider specific types of tourism attractions at certain destinations, such as art and local culture, wine and gastronomic production (Medina, 2003; Poria, 2003; Hamilton, 2004; Brunori & Rossi, 2000; Telfer, 2001; Correia et al., 2011). Cultural and natural heritage are also deemed to be significant determinants of a tourist's destination choice. Heritage tourism is often analysed as a specific tourism segment, influenced by the tourist's personal characteristics, awareness and perception as well as by the site's attributes (Poria, 2003). Hamilton (2004) uses the number of UNESCO World Heritage sites as a proxy for a country's cultural attractiveness and the total protected area at the national level as a proxy for the availability of undeveloped land. An important determinant of tourism destination choice is the presence of coastal areas and sandy beaches. Previous studies have demonstrated that a country's coastline and beach length positively influence the number of national tourist arrivals (Maddison, 2001; Bigano et al., 2007).

The present study is placed in this second branch of research and aims to understand the determinants affecting the choice of worldwide coastal tourist destinations. In particular, the study analyses the potential role that marine environmental quality, biodiversity factors and marine cultural values may exert on consumer choice. The existing literature has explored tourists' destination choice and motivations with distinct perspectives, but has largely neglected to incorporate environmental, biodiversity and cultural values dimensions. The research aims at exploring the following questions: why do (national and international) tourists choose coastal destinations? In particular, is marine environmental quality a factor affecting destination choice? In broader terms, does the preference of particular consumers (tourists) for a coastal destination (also) depend on environmental and biodiversity factors? Is it possible to model and measure that effect?

Empirical research has mostly focused either on ecotourism or a specific segment in the tourism market, including specialist wildlife-viewing tourism, such as safaris, scuba diving and bird watching (Wunder, 2000; Naidoo & Adamovicz, 2005). More recently, the work of Macagno et al. (2009) explored the analysis of domestic tourist data set for Ireland, on the one hand, and the Irish Natura 2000 Network data set on the other, and estimated the role of the biodiversity and landscape indicators of a region in explaining the observed tourism flows.

In what follows section 2 describes the dataset, section 3 the model specification, the estimation procedure and the main results, section 4 contextualises the results for the southern Mediterranean area and section 5 derives some concluding policy implications.

2. Ecosystem attractiveness and coastal tourism demand: the database

This study analyses the impacts of biodiversity and environmental amenities on domestic and international coastal tourism flows globally.[2] Coastal tourists seek beautiful places to spend their holidays and they tend to look for the same conditions that are generally associated with high environmental amenities, namely warm weather, sunshine, unspoilt nature, clean air and water. The

[2] To our knowledge, a little-studied key factor affecting the choice of a particular tourist coastal destination is the amount of biodiversity in that destination. For the sake of this study, biodiversity is defined as the stock of endogenous fauna and flora at the coastal destination. Biodiversity is tested as one of the motivators for the choice of tourist coastal destination.

underlying hypothesis to be tested is that species and habitat diversity can exert an influence, in addition to other variables, on a tourist's choice of destination. Each country's biodiversity profile is described using a set of species and habitat diversity indicators from data published by the World Bank and the World Resource Institute. The demand for a country's tourism services is disaggregated into an international and a domestic component, as these may follow distinct behavioural consumption patterns and may be sensitive to different aspects of the biodiversity profile of the destination.

We therefore focus on both international and domestic tourism arrivals worldwide, looking at both developed and developing countries,[3] building upon the state of the art literature extending the current tourist destination choice models to include biodiversity variables in addition to the widely used socio-economic drivers, climate factor drivers, and the presence of cultural heritage sites at the chosen destination. From the econometric/methodological point of view, the study adopts a three-equations model, simultaneously estimated by three stage least square (3SLS) in order to capture different determinants that explain (international and domestic) tourists' coastal destination choice and to build rigorous economic and empirical relationships between distinct variables.

It is important to understand the extent to which biodiversity/environmental characteristics are instrumental to the enjoyment of tourist beach activities (it is more pleasant to sunbathe on an immaculate white sandy beach than in a polluted area) or to a direct enjoyment of biodiversity/ecosystem cultural goods and services. For the purpose of this study, data has been gathered from a broad set of different sources with the objective to create a comprehensive database, encompassing many relevant determinants of tourism demand highlighted in the literature. Table 1 shows the full set of variables used in this study, including the respective data sources and the unit of measurement.

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[3] Between 1969 and 1979, the World Bank encouraged developing countries to invest in tourism as a strategy for attracting foreign investment, and the governments of developing countries began to see tourism as a means to redistribute resources from north to south. The World Tourism Barometer (WTO, 2008) reports that, in the last few years, international tourism has registered a sharp increase in the number of arrivals, reaching 900 million in 2007. The Middle East has registered the highest growth rate, with an estimated 13% rise with respect to 2006. In second place are Asia and the Pacific, with an increase of 10%, followed by Africa, registering an 8% rise to the figure of 44 million visitors in 2007. East Asia and the Pacific, Asia, the Middle East and Africa, on the other hand, are forecast to record growth rates of over 5% per year, compared to the world average of 4.1% (Honey & Krantz, 2007). Although Europe and North America remain the top destinations in international travel, representing about 65% of all international tourist arrivals, these more mature regions are expected to show lower than average growth rates in coming decades. In addition, tourism has become increasingly important for developing countries, accounting for 70% of exports from the Least Developed Countries (LDCs). The United Nations Conference on Trade and Development (UNCTAD) qualifies tourism as one of the main contributors to GDP of 49 least-developed countries, as well as one of the main sectors in terms of employment (Christ et al., 2003). Furthermore, many of those countries host a significant share of worldwide biodiversity hotspots, including Mexico, Brazil, Thailand, Malaysia and Indonesia. However, tourism in developed countries can also have significant implications for biodiversity conservation, because biodiversity hotspots also occur in these northern destinations, such as the California Floristic Province, the northern part of Mesoamerica, the Mediterranean Basin, the Caucasus, and the mountains of south-central China. It is therefore important to assess the degree to which tourism is dependent on biodiversity, in particular, among biodiversity-rich countries. In this way it is possible to shed light on the proportion of tourism's GDP contribution and its link with biodiversity, which may represent the principal tourism attraction factor.

Table 1. Description of the data and data sources

Variables	Unit of measurement	Year	Source
International arrivals	1000	1995	Bigano et al. (2004)
Domestic arrivals	1000	1995	Bigano et al. (2004)
International arrivals NUTS II	1000	1995	Bigano et al. (2004)
Domestic arrivals NUTS II	1000	1995	Bigano et al. (2004)
Number of days	Number	1995	Tol & Bigano (2006)
Expenditures	USD/person/day	1995	Tol & Bigano (2006)
Total Expenditures	USD	1995	Constructed variable
Population	1000	1995	CIA World Fact Book (2001)
Population/km2	1000	1995	World Resources Database 2000-2001
Area km2 (land+water)	Km2	1995	CIA World Fact Book (2001)
GDP per capita 1995 USD	USD	1995	Bigano et al. (2004)
Length coastline	Km	2000	World Vector Shoreline (2000)
Beach length	Km	1990	Dronkers et al., (1990)
Harbour Length	Km	1990	Dronkers et al., (1990)
Area covered by wetlands	%	2000	World Bank (2007)
Area covered by forests	%	2000	World Bank (2007)
Area covered by reefs	%	2000	World Bank (2007)
Area covered by mangroves	%	2000	World Bank (2007)
Number of amphibians species	Number	2000	World Bank (2007)
Number of reptiles species	Number	2000	World Bank (2007)
Number of plant species	Number	2000	World Bank (2007)
Number of bird species	Number	2000	World Bank (2007)
Number of mammal species	Number	2000	World Bank (2007)
Biodiversity index for birds	Number of species * threat status	2007	Wendland et al. (2010)
Biodiversity index for mammals	Number of species * threat status	2007	Wendland et al. (2010)
Biodiversity index for plants	Number of species * threat status	2007	Wendland et al. (2010)
No. world heritage sites	Number	2003	UNESCO
Annual precipitation	Mm	Average 1961-1990	Bigano et al. (2004)
Annual temperature	°C	Average 1961-1990	Bigano et al. (2004)

Note: Data on tourism arrivals, both at the national and sub-national level, on GDP per capita, expenditures and length of stay have been retrieved from Bigano et al. (2004), who created a worldwide database encompassing cross-sectional data for 207 countries and respective distribution into NUTS (Nomenclature of Units for Territorial Statistics) type 2 regions. This spatial categorisation will allow us to disentangle the coastal regions tourism flows from the land-locked regions. Population density data for 1995 was collected from the World Resource Database, the country surface area from the CIA World Factbook, coastline and beach length from Reefbase and the Report of the IPCC Coastal Zone Management Subgroup.

Since the present paper aims to explore the impact of biodiversity(s) dimension(s) on tourism flows on a global scale, we focus on two biodiversity indicators. We refer to habitat abundance and species richness, which are available for all the countries under consideration. Habitat abundance is defined as the share of a country's surface covered by a particular habitat type; here the surface covered by coral, coastal wetland and forests. This indicator is considered important in the description of a country's biodiversity profile since habitat distribution, together its spatial landscape patterns, are strongly linked to the overall condition of ecological resources (O'Neill et al., 1997). Coastal wetlands and forests are well-studied ecosystems for which good quality data are available and their role in the hosting and conservation of biodiversity is widely acknowledged. Forests are a biodiversity-rich ecosystem and they support a vast array of species from birds and mammals to soil microbes. As a consequence, logging and deforestation may cause substantial changes in tree species abundance and distribution as well as significant losses of critical habitat hindering the survival of those species (Lyndenmayer, 1999; Bawa & Seidler, 1998). Similarly, the high biological productivity of coastal wetlands and the strong selection pressure peculiar to the aquatic environment produce a rich biota associated only with wetlands. This ecosystem typically occurs in discrete patches, so populations tend to be isolated and more vulnerable to extinction (Gibbs, 2000).

Species richness is defined as the number of different species living in a given area. This indicator is related to community diversity and it underlies many ecological models and conservation strategies (Gotelli & Coldwell, 2001). It is a highly intuitive measure of biodiversity and is relatively easy to compute once the scale of the analysis has been determined. Previous studies suggest that the species richness of certain indicator taxa, namely birds, may reflect that of other, more poorly studied taxa (Prendergast & Eversham, 1997). Chase et al. (2000) use birds and small mammal species as biodiversity indicators for the coastal sage scrub habitats of southern California. Noss (1990) suggests that flagship species and vulnerable species may be used as indicators of species diversity. Due to the geographical scale of the present analysis, we decided to focus on bird and mammal richness, testing for whether they behave as flagship or 'charismatic' species, by exerting an effect on tourist preferences and therefore the choice of their destination. The data for both habitats and species was retrieved from the World Bank (2007). In addition to the number of species, we included the Biodiversity Index for birds and mammals, which takes into account both the number of species per unit of area. In addition, we also explore the use of the threatened species index, which captures the number of threatened species living in a 10 square kilometre area[4] weighted by the level of risk that each of the individual species is subject to; thus providing an indirect measure of the degree of stress of species and ecosystems that can be interpreted as signalling the effectiveness of the country's biodiversity conservation policies[5] (Wendland et al., 2009). Finally, in addition we decided to include an additional synthetic indicator reflecting the level of threat to which each species is exposed. Synthetic biodiversity indicators have regularly been computed for bird and mammal species (Wendland, 2009). These indices are constructed using the most recent available global vector data on species ranges of birds (BirdLife International) and mammals (Baillie et al., 2004) weighted by their threat status as defined by the IUCN Red List. In addition, the number of sites recorded in the World Heritage List for each country was retrieved from UNESCO. Finally, data on average annual temperature and precipitation for the period 1961-1990 have been retrieved from Bigano et al. (2004).

[4] The resolution is 0.0833 degree, corresponding to ca. 10km at equator (Wendland et al., 2009).

[5] According to the 1992 Convention on Biological Diversity, biodiversity is defined as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems". The convention foresees an obligation for each contracting party to develop national strategies and plans for the conservation of biodiversity. At the very basis of biodiversity conservation stands the need to be able to measure it and to quantify its status and trends. Since biodiversity, and the manipulation of the respective data, are rather too complex to map, their quantitative assessment is often done by means of indicators. In turn, there is a variety of potential biodiversity indicators and the choice of the most appropriate ones, as well as the level of detail of their measurement, depends on the objective and on the scope of the analysis under consideration.

3. Ecosystem attractiveness and coastal tourism demand: model specification and results

When selecting the tourist destination (where to go and how long to stay), consumers usually choose according to income and time constraints/money availability and preference for the destination. The preference for the destination may depend on several, different factors, like personal taste, fashions, information 'cascades', the recreational characteristics of the destination and the environmental quality of the holiday destination. In order to capture these complex relationships, we propose to apply an econometric model that seeks to address simultaneously three endogenous variables: i) tourist arrivals at a destination (the destination function); ii) tourist expenditure; iii) tourist preferences for trip characteristics. In practice, we propose to make use of a three equations model where some equations contain endogenous variables among the explanatory variables. The system is estimated by the 3SLS estimation (Zellner & Theil, 1962)[6] where we estimate simultaneously the following three-equation model:

Number of arrivals = f(total expenditures, preference for the destination's characteristics); (1)

Total expenditures = f(macroeconomic environment (socio-economics and demographics of the destination)); (2)

Preference for the destination = f(intrinsic recreational and environmental features of the selected destination) (3)

This empirical strategy is motivated by two main requirements. The first one is econometrics-diagnostics based, since a simple linear model that explains arrivals in particular destinations as a function of selected explanatory variables, estimated by OLS (Ordinary Least Squares,), produces estimates, affected by heteroschedasticity and multicollinearity. The second responds to the attempt to construct and test an econometric model that describes and captures complex relationships in a better/more efficient way than a single, linear specification. In this context, in Equation (1) we attempt to explain the number of arrivals in a destination as a function of budget constraint (total expenditures) and preference for the destination. Since we are studying coastal tourism, we assume that most tourists go to coastal destinations for two main (in our setting alternative) reasons: i) going to the beach and ii) visiting/enjoying environmental/cultural amenities at the coast. The preference for the destination positively affects the choice of that location, and therefore the number of arrivals. In Equation (2) we attempt to explain the total expenditures (mostly prices of touristic destinations) as functions of the macroeconomic milieu (socio-economics and demographics variables) of the destination itself. We expect that the richer the country (in terms of per capita GDP) the higher the total expenditure. Finally, in Equation (3) we attempt to model determinants of tourists' preference for the destination. For the study at issue we assume that the preference for the coastal destination depends on the cultural and environmental amenities provided by the coastal destination itself. Climatic variables might also affect (positively or negatively) the endogenous variable under consideration.

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[6] Typically, the endogenous explanatory variables are dependent variables from other equations in the system In particular, under 3SLS a structural equation is defined as one of the equations specified in the system. A dependent variable will have its usual interpretation as the left-hand-side variable in an equation with an associated disturbance term. All dependent variables are explicitly taken to be endogenous to the system and are treated as correlated with the disturbances in the system's equations. All other variables in the system are treated as exogenous to the system and uncorrelated with the disturbances. The exogenous variables are taken to be instruments for the endogenous variables.

After several checks, we simultaneously estimate the following three equations model, where most variables are similarly expressed in logarithms, so that estimated coefficients can be interpreted as elasticity.

$$Log\ (Coastal\ Arrivals_i) = \beta_0 + \beta_1 \bullet Log\ (Total\ Expenditures_i) + \beta_2 \bullet Log\ (Protected\ Areas_i) + \beta_3 \bullet Log\ (UNESCO\ Cultural\ Sites_i) + \varepsilon_i \quad (1a)$$

$$Log\ (Total\ Expenditures_i) = \beta_0 + \beta_1 \bullet Log\ (Destination\ GDP\ per\ Capita_i) + \beta_2 \bullet Log\ (Coastal\ Population\ Density_i) + \varepsilon_i \quad (2a)$$

$$Log\ (Protected\ Areas_i) = \beta_0 + \beta_1 \bullet Log\ (Annual\ Average\ Precitipation_i) + \beta_2 \bullet Log\ (Annual\ Average\ Temperature_i) + \beta_3 \bullet Log\ (Forest\ Area_i) + \beta 4 \bullet Log\ (Wetlands\ Area_i) + \beta_5 \bullet Log\ (Biodiversity\ Index\ for\ Mammals_i) + \beta_6 \bullet Log\ (Biodiversity\ Index\ for\ Birds_i) + \varepsilon_i \quad (3a)$$

Equation (1a), the destination function, relates arrivals to 'cultural services' provided by the coastal tourism destination: the percentage of the country territory destined to be a protected area and the number of UNESCO protected cultural sites, which usually also have environmental features. Equation (3a) explains the protected coastal areas surface in the destination country as a function of selected climatic, environmental variables and biodiversity indicators. The 3SLS results are presented in Table 2.

Table 2. Choice of coastal destination: empirical results

Specification	Number of Observations	(International Coastal Arrivals) "R-Squared"	(Domestic Coastal Arrivals) "R-Squared"
Equation 1	59	0.61	0.47
Equation 2	59	0.68	0.68
Equation 3	59	0.36	0.57
		International Coastal Arrivals	Domestic Coastal Arrivals
Equation 1: (Log) Coastal Arrivals			
(Log) Total Expenditures		0.39***	0.11
(Log) Number of Unesco Sites		1.39***	2.38***
(Log) Protected Area (% of national territory)		0.60*	1.65
Constant		9.03***	11.92***
Equation 2: (Log) Total Expenditures			
(Log) Destination GDP per Capita		0.82***	0.83***
Population Density on the Coast		-0.02	-0.001
Constant		1.04	0.97
Equation 3: (Log) Protected areas			
(Log) Annual Average Temperature		0.52	0.50*
(Log) Annual Average Precipitation		-1.11***	-1.12***
Biodiversity Index Mammals		0.01*	0.01***
Biodiversity Index Birds		0.41	0.5***
(Log) Forest Area		0.43	0.45*
(Log) Wetlands Area		0.15***	0.12*
Constant		4.50***	5.20*

*** =statistically significant at the 1% level; * =statistically significant at the 5% level.

Source: authors' computation.

Table 2 reports estimated coefficients for both international and domestic arrivals. The (logged) number of UNESCO World Heritage sites produces a positive impact on both international and domestic tourist arrivals. The (logged) percentage of the destination country's territory that is within a coastal protected area positively affects tourist arrivals. However, the estimated coefficient is not statistically significant for (domestic tourists), nor are the (logged) total expenditures. In the case of international tourists, the magnitude of the estimated coefficient for UNESCO cultural sites is larger than the estimated coefficient for protected areas in the coastal destination. Both coefficients are statistically significant. Certain species and habitat diversity indicators do exert a significant influence on the country's extent of protected areas. The Biodiversity Indexes for bird and mammal species and the country's (logged) forest[7] and wetland areas are positively related to domestic and international tourist arrivals. Those biodiversity related variables affect the logged percentage protected area by country, which, in turn, affects tourist arrivals in coastal destinations. Finally, climatic variables affect the extent of protected areas. In particular, (logged) annual average precipitations negatively impact the area designated with protected status. Interestingly, average annual temperature positively affects the existence of protected areas.

It is worth highlighting that results differ for Equation (3a) between international and domestic arrivals. The model explains much more of the variation for domestic tourism than for international tourism, denoted by a higher R-squared value. The existence of extensive protected areas is not a convincing determinant of domestic coastal arrivals. This result might be interpreted as suggesting that although domestic tourists do not account for protected areas when choosing their coastal destination, they do however care that a percentage of the national territory is protected, so that the environment and biodiversity are safeguarded. This result might depend on nationalistic feelings, or other variables that we have not considered in this study.

4. Computing the reduced quantity and quality of the ecosystem services in the selected climate scenario

The aim of this section is to estimate the possible effects of climate change on the quality and quantity of ecosystem services and the related impact on coastal tourism demand in the southern Mediterranean region.

It would have been useful to have detailed information on the possible evolution of ecosystem/biodiversity indicators in this region with country details, but this information is however not available at present.

We therefore work with two main steering factors driving international and domestic tourism arrivals for the selected countries: we refer to coastal 'Protected Area (PA)' (measured as a percentage of the national territory) and the 'Number of Unesco Sites (NUS)' at the coast.

The adopted 'reference' climate scenario follows the COPI (Costs of Policy Inaction) study by Braat et al. (2010). The projection of the temperature for 2050 is +1.9 °C, i.e. consistent with the Intergovernmental Panel on Climate Change scenario known as A1B IPCC SRES (IPCC, 2000)

According to the estimates derived from the micro-econometric 3SLS model, the PA elasticity coefficient ranges between 0.6 and 1.65, respectively for domestic and international tourists in coastal areas. By the same token, the NUS elasticity coefficient ranges between 1.39 and 2.38.

The above-mentioned COPI study, which focuses on the cost of climate-change policy inaction, reports a potential loss for 2050 in protected areas associated with biodiversity losses of -9.8% in Asian countries, of -34.7% in Eastern Europe and Central Asia, of -15.3% in Africa (Chiabai et al., 2011). By applying the related estimated elasticity, this allows us to compute in principle a loss of coastal tourist arrivals in the three broad areas reported in Table 3. Due to a shortage of more detailed data, at the moment the results for Africa can be applied to Algeria, Egypt, Libya, Morocco and

[7] Forest area implies coastal forest areas.

Tunisia; those for other Asian countries to Israel, Jordan, Lebanon, Palestinian Autonomy, Syria; those for Central Asia to Turkey.

Table 3. Steering factor: change in protected areas. % changes in tourist arrivals in coastal areas with respect to (wrt) baseline

EU and Central Asia representative of: Turkey			Asia, representative of: Israel, Jordan, Lebanon, Palestinian Autonomy, Syria			Africa representative of: Algeria, Egypt, Libya, Morocco and Tunisia	
International	Domestic		International	Domestic		International	Domestic
-20.8%	-57.3%		-5.9%	-16.2%		-9.2%	-25.2%

This is in principle; in practice the effectively statistically significant coefficient relates only to the international tourist segment. Therefore, just this one should be used to infer potential impact on the tourism sector. Table 4 reports the final effect on total tourism arrivals in the southern Mediterranean taking into account the weight of international coastal tourists arrivals over the country total, as estimated by Bigano et al. (2004),

Table 4. Steering factor: change in protected areas. % changes in total tourist arrivals in the southern Mediterranean wrt no climate change baseline

Algeria	-0.70
Egypt	-0.62
Israel	-2.12
Jordan	Na
Lebanon	-2.04
Libya	-0.17
Morocco	-3.96
Palest. Aut.	Na
Syria	-2.81
Tunisia	-4.52
Turkey	-2.08

Notes: Na = Not available.

For completeness, even though not directly related to biodiversity factors and to climate change, we report some highly speculative, but still interesting estimates of the potential effects on tourism arrivals in coastal areas of the deterioration/disappearance of Unesco Sites. These are significant determinants of both domestic and international tourism choices. Trends in NUS derive from our own elaboration based on the current map/number of US in the countries under consideration as well as their coastal distribution, retrieved from the Unesco WHC database. The underlying assumption is that in a context of policy inaction the loss of coastal sites can be 1/5. This is on an *ad hoc* basis following a broad discussion with experts. Then the total percentage loss of Unesco sites can be computed and the final potential effects on coastal domestic and international tourist arrivals can be estimated applying the related elasticity. The resulting outcomes are reported in Table 5, below.

Table 5. Steering factor: change in NUS. % changes in coastal tourist arrivals in the southern Mediterranean wrt baseline

	NUS*	NUS Coastal*	US: fraction at risk	Changes in Coastal Tourist Arrivals	
				International	Domestic
Algeria	7	3	-0.086	-11.9%	-20.4%
Egypt	7	3	-0.086	-11.9%	-20.4%
Morocco	8	3	-0.075	-10.4%	-17.9%
Tunisia	8	3	-0.075	-10.4%	-17.9%
Libya	5	3	-0.120	-16.7%	-28.6%
Israel	6	3	-0.100	-13.9%	-23.8%
Jordan	4	0	0.000	0.0%	0.0%
Lebanon	5	2	-0.080	-11.1%	-19.0%
PA	Na	Na	Na	Na	Na
Syria	6	0	0.000	0.0%	0.0%
Turkey	10	3	-0.060	-8.3%	-14.3%

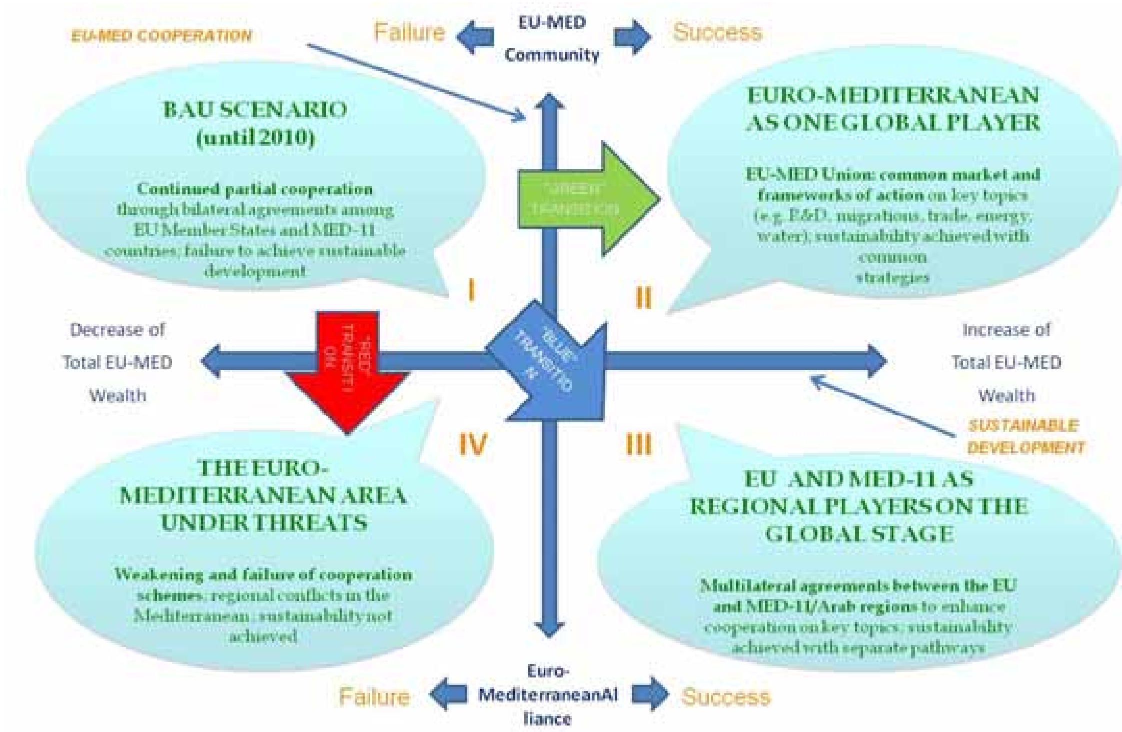
Note: * Source: Unesco WHC dataset (www.whc.unesco.org).

Na: Not available.

5. Applying results to the MEDPRO scenarios

The MEDPRO project proposes a set of qualitative storylines describing possible alternative socio-economic developments for the southern Mediterranean countries. Their detailed description can be found in Sessa (2011). They are briefly summarised below by Figure 1.

Figure 1. The different MEDPRO social-economic development scenarios



Source: Sessa (2011).

To translate climate change effects on the tourism sector in the four scenarios, the following assumptions have been made.

- Climate change pressure (+1.9°C in 2050) will remain the same in the four different MEDPRO scenarios. This is reasonable, as it is well known that because of the long-term inertias in the climate system, current trends in temperature increase are basically predetermined until the middle of the century. Even assuming, very optimistically (but quite unrealistically) that aggressive mitigation policies will be put in place by the international community, a detectable reduction in temperature can be observed only after 2050.
- Therefore, different types of impact on the tourism sector are caused by different assumptions on adaptation, rather than mitigation policy actions. By the same token, different economic consequences triggered by dynamics in the tourism sector depend on the different economic circumstances in which those dynamics materialise.
- As to the first point, data in Table 4 refer to the MEDPRO BAU scenario and are derived, as stated, assuming total policy inaction to safeguard protected areas against potential climate change pressure. There are basically no quantitative support mechanisms to estimate objectively what could happen in the other MEDPRO scenarios. Therefore, we assume that in the "EU-southern Mediterranean areas under threat" scenario (AKA "Decline and Conflict"), not only is no action taken to offset negative climate change impacts, but that fewer funds are also available/devoted to standard maintenance/protection activities. This could be a combined effect of lower international cooperation for sustainability and a lower priority of environmental claims compared to other societal needs. The consequence is a loss of protected areas, which is actually twice as high as that projected in the BAU scenario. In the "EU-MED as a whole global player" scenario (AKA Enhanced Cooperation), on the contrary, we assume that the rate of protection is 100%. This is the result of the high priority given to sustainability concerns, thus including those related to the environmental dimension, outlined in the scenario. Accordingly, all the potential negative implications of climate change on biodiversity and thus on tourism attractiveness are offset. In the "EU-MED as regional players on the global stage" scenario (AKA Fragmented Cooperation), we assume a biodiversity and protected areas loss that is half that of the BAU. Action against the negative consequences of climate change is taken, but resources are not as abundant as in the enhanced cooperation case.

Table 6 summarises the impacts on tourism arrivals in the 4 MEDPRO scenarios in 2050.

Table 6. Steering factor: change in protected areas. % changes in total tourist arrivals in the southern Mediterranean wrt no climate change baseline. All MEDPRO scenarios

	BAU	Enhanced Cooperation	Fragmented Cooperation	Decline and Conflict
Algeria	-0.70	0	-0.35	-1.4
Egypt	-0.62	0	-0.31	-1.24
Israel	-2.12	0	-1.06	-4.24
Jordan	Na	Na	Na	Na
Lebanon	-2.04	0	-1.02	-4.08
Libya	-0.17	0	-0.085	-0.34
Morocco	-3.96	0	-1.98	-7.92
Palest. Aut.	Na	Na	Na	Na
Syria	-2.81	0	-1.405	-5.62
Tunisia	-4.52	0	-2.26	-9.04
Turkey	-2.08	0	-1.04	-4.16

Na: Data not available.

Source: Authors' computation

- As to the second point, Tables 7, 8, 9 and 10 report the assumptions on the potential weight of tourism sectors on GDP in the southern Mediterranean countries under the different MEDPRO scenarios. They are derived from Lanquar (2011) enriched with projections up to 2050 jointly elaborated by ourselves and Lanquar. These assumptions will drive the exercise in MEDPRO WP8.

Table 7. Tourism total contribution to GDP in the southern MED countries: BAU Scenario

	2010	2015	2020	2025	2030	2050
Algeria	7.3	7.2	7.5	7.8	8	9
Egypt	17.5	15.6	16.5	17	18	19
Israel	7.4	7.8	8.3	8.8	9.2	9
Jordan	20.2	19.6	19.7	19.7	20	20
Lebanon	33.7	33.2	34.3	32	30	22
Libya	3.2	2.8	3.9	6	8	14
Morocco	18.9	20.5	21.3	21.8	22.5	23
Syria	14	14	13.6	14	14	17
Tunisia	17.6	15.8	14.3	14	13.8	14
Turkey	10	9.6	8.9	8.6	8.5	8
AVERAGE	10.9	11	11	11.5	12	12

Source: authors'computation.

Table 8. Tourism total contribution to GDP in the southern MED countries: enhanced cooperation scenario

	2010	2015	2020	2025	2030	2050
Algeria	7.3	7.9	8.2	8.8	9.3	11.3
Egypt	17.5	17.0	18.0	19.2	21.0	23.8
Israel	7.4	8.5	9.1	9.9	10.7	11.3
Jordan	20.2	21.4	21.5	22.3	23.3	25.0
Lebanon	33.7	36.2	37.4	36.2	35.0	27.5
Libya	3.2	3.1	4.3	6.8	9.3	17.5
Morocco	18.9	22.4	23.2	24.6	26.3	28.8
Syria	14.0	15.3	14.8	15.8	16.3	21.3
Tunisia	17.6	17.2	15.6	15.8	16.1	17.5
Turkey	10.0	10.5	9.7	9.7	9.9	10.0
AVERAGE	10.9	12	12	13	14	15

Source: authors' computation.

Table 9. Tourism total contribution to GDP in the southern MED countries: fragmented cooperation scenario

	2010	2015	2020	2025	2030	2050
Algeria	7.3	7.9	8.2	8.8	9.3	9.8
Egypt	17.5	17.0	18.0	19.2	21.0	20.6
Israel	7.4	8.5	9.1	9.9	10.7	9.8
Jordan	20.2	21.4	21.5	22.3	23.3	21.7

Lebanon	33.7	36.2	37.4	36.2	35.0	23.8
Libya	3.2	3.1	4.3	6.8	9.3	15.2
Morocco	18.9	22.4	23.2	24.6	26.3	24.9
Syria	14.0	15.3	14.8	15.8	16.3	18.4
Tunisia	17.6	17.2	15.6	15.8	16.1	15.2
Turkey	10.0	10.5	9.7	9.7	9.9	8.7
AVERAGE	10.9	12.0	12.0	13.0	14.0	13.0

Source: authors' computation.

Table 10. Tourism total contribution to GDP in the southern MED countries: decline and conflict scenario

	2010	2015	2020	2025	2030	2050
Algeria	7.3	7.2	7.5	7.4	7.0	7.1
Egypt	17.5	15.6	16.5	16.1	15.8	15.0
Israel	7.4	7.8	8.3	8.3	8.1	7.1
Jordan	20.2	19.6	19.7	18.7	17.5	15.8
Lebanon	33.7	33.2	34.3	30.3	26.3	17.4
Libya	3.2	2.8	3.9	5.7	7.0	11.1
Morocco	18.9	20.5	21.3	20.7	19.7	18.2
Syria	14.0	14.0	13.6	13.3	12.3	13.5
Tunisia	17.6	15.8	14.3	13.3	12.1	11.1
Turkey	10.0	9.6	8.9	8.2	7.4	6.3
AVERAGE	10.9	11.0	11.0	10.9	10.5	9.5

Source: authors' computation.

6. Quantifying biodiversity and protected area costs

This final section proposes a tentative quantification of potential adaptation costs to offset negative impacts on tourism induced by ecosystem deterioration. In this specific case, we decided not to analyse adaptation measures that can be directly performed by the tourism sector,[8] but rather, and more consistently with the whole study, to focus on activities addressed to biodiversity ecosystem preservation in the areas under study. Specifically, the cost assessment considers the conservation-management of currently protected areas and registered expenditure in biodiversity protection.

The information on existing domestic protected area budget is heterogeneous and non-systematic. Moreover, retrieving expenditure that is specifically devoted to biodiversity protection is even more difficult (Lopez et al., 2006).

[8] Adaptation strategies in the tourism sector are usually classified as: technical, behavioural, industrial and financial (OECD, 2007). The first relate to those interventions aiming to contrast, in physical terms a negative impact. In the case of coastal tourism for instance, these can be hard or soft measures against beach erosion/submergence like sea wall building or beach nourishment. Behavioural measures are those modifying the characteristics of tourism supply. A typical example is the shift or extension of the tourist season (change in timing) in order to take advantage of/compensate for changes in climatic weather conditions or an enrichment of supply coupling environmental attractiveness with arts or leisure activities. Industrial strategies pertain to fusions, conglomerations, consortium formation aiming to exploit economies of scale, lowering costs and increasing efficiency. Finally, there are financial strategies aiming at risk diversification/insurance like the use of weather derivatives. Assessing the cost of behavioural industrial and financial strategies is very complex. In general the tourism sector appears to be one of the most adaptable.

In general these two components make up a low share of the environmental expenditure for the whole country. For instance, in the EU they contribute a minute 8% to total environmental expenditure, which in turn is roughly 0.5% of total GDP (Olsson, 2005).

A study by the International Union for Conservation of Nature and Natural Resources (IUCN) focusing specifically on the Mediterranean (Lopez et al, 2006) tries to organise all the scattered evidence estimating first the total amount actually spent on protected areas and biodiversity protection; secondly, and more interestingly, what should be spent to meet protection needs effectively.

This study is thus the basis for the estimates proposed. It reports both average national expenditure per hectare of protected area (all categories) and the registered flow of biodiversity-related foreign aid. The first data stems from survey work covering roughly one third of all protected areas in the Mediterranean. Using this information, multiplying for the hectares of protected areas in the different countries (derived from the IUCN-UNEP-WCMC, 2011 database) and then adding foreign aid, it is possible to provide an estimate of total 'current'[9] expenditure for protected areas (Table 11).

Table 11. Computation of protected area and biodiversity protection cost in the southern MED countries

	Protected area National budget (all categories of PA) US$/ha (*)	Official Development Aid for Biodiversity (1998-2003) 1000 US$ (*)	Protected areas terrestrial 2003 1000 ha (')	Protected Areas marine 2003 1000 ha (')	Total expenditure as % of country GDP in 2003
Turkey	7.2	337	1480	193	0.004
Syria	1.6	na	120	2	0.001
Lebanon	19.3	145	5	1	0.001
Jordan	10.2	na	168	3	0.017
Israel	49	na	374	2	0.016
Palestine	na	888	na	na	na
Egypt	0.7	12022	5799	561	0.020
Libya	na	na	na	na	na
Tunisia	1.2	234	201	43	0.002
Algeria	2.8	8	14663	8	0.060
Morocco	0.7	1882	631	50	0.005
Total		15516	23441	864	0.013

Notes:

(*) Source: Lopez et al. (2006)

(') Source: IUCN and UNEP-WCMC (2011).

Compared to GDP, conservation of protected areas and biodiversity entails an expenditure ranging from the 0.06% of Algeria to the 0.001% of Syria and Lebanon. The total southern Mediterranean expenditure is 0.013% of GDP. Foreign funds are particularly important in Egypt, Morocco and Tunisia.

[9] The cost/ha data refer to 2005 for national expenditure, to 2003 for international biodiversity-related aid. Therefore for consistency the information on GDP and ha of protected terrestrial and marine areas also dates from 2003.

These values are thus assumed to represent what is spent in the MEDPRO reference scenario, where 'nothing changes'. As stated above, keeping this current expenditure unchanged (as a % of GDP) would not prevent a deterioration of ecosystems/ biodiversity and thus of the related tourism demand.

Table 7 assumes that in the "EU-MED areas under threat" scenario (AKA "Decline and Conflict"), the loss in protected areas (and thus the decline in tourism demand) is actually double that of the reference scenario. Therefore it is assumed here that the associated expenditure for protected areas and biodiversity halves.

In the "EU-MED as a whole global player" scenario (AKA Enhanced Cooperation), the assumed rate of protection is 100%. To estimate the expenditure needed to reach this level of protection the reference is again Lopez et al. (2006), which estimate the financing gap of protected areas in the Mediterranean. The financing gap is defined as the budgets required per hectare to effectively protect and reasonably manage the regional wealth of protected areas. Even a rough approximation of this value is hard to find as it depends on the specific protection needs of each area, the size, the type (marine or terrestrial), the type of conservation required. That said, Lopez et al. (2006) estimated the costs based on the budgets available in some countries and/or for particular protected areas which are supposed to reasonably cover at least the basic management needs. The average value per hectare in non EU Mediterranean countries ranges between a minimum of $28 to a maximum of $94 for terrestrial protected areas and from a minimum of $81 to a maximum of $226 for marine protected areas. Unfortunately, the country breakdown is not provided. Therefore, to recover the total country costs, unit costs are simply multiplied by the number of country hectares of terrestrial and marine areas that are protected.

Finally, in the "EU-MED as regional players on the global stage" scenario (AKA Fragmented Cooperation), where biodiversity and protected areas loss are half of the BAU, an expenditure is assumed that is the average between that of the BAU and of the Enhanced Cooperation scenario.

Note that some small adjustments have been necessary for Lebanon and Israel that with their relatively high expenditure per ha of protected areas in the BAU are already at a level of sustainability comparable to that of the Enhanced Cooperation scenario assuming the lower financing gap.

All the data are summarised in Table 12.

Table 12. Cost of adaptation to biodiversity/ecosystem losses in the southern MED in the MEDPRO scenarios

	BAU	Enhanced cooperation		Fragmented cooperation		Failed cooperation
		min	Max	min	max	
Turkey	0.004	0.019	0.060	0.012	0.032	0.002
Syria	0.001	0.016	0.054	0.009	0.028	0.0005
Lebanon	0.0012	0.0009	0.0029	0.0011	0.0021	0.0006
Lebanon C	0.0012	0.0021	0.0029	0.0016	0.0021	0.0006
Jordan	0.017	0.049	0.161	0.033	0.089	0.009
Israel	0.016	0.009	0.030	0.012	0.023	0.008
Israel C	0.016	0.0226	0.030	0.019	0.023	0.008
Palestine	na	na	Na	na	na	na
Egypt	0.020	0.252	0.807	0.136	0.414	0.010
Libya	na	na	Na	na	na	na
Tunisia	0.002	0.033	0.104	0.018	0.053	0.001
Algeria	0.060	0.608	2.019	0.334	1.040	0.030
Morocco	0.005	0.044	0.141	0.024	0.073	0.002
Total	0.013	0.104	0.34	0.05	0.17	0.003

On considering Table 12, it emerges that full protection would require quite a substantive (almost ten, thirty-fold depending on assumptions) increase in protection expenditure. These values are somewhat higher than those reported by other studies like the Convention of Biological Diversity (CBD, 2005) reporting a funding gap in developing countries somewhere between 71% and 83%. However it is important to stress that the Mediterranean area was not covered quantitatively by CBD.

The situation is also quite differentiated across countries. As anticipated, Lebanon and Israel seem to present a current protection expenditure closer to the level offering full protection (they would need, roughly, to double the current financial support to protected areas and biodiversity) while other countries like Syria and Tunisia seems much further away from the ‘optimal’ protection level.

7. Conclusions

Coastal tourism shows a stronger dependency on a healthy environment than many other industries and economic sectors. Tourists seek beautiful places to spend their holidays and they tend to look for conditions that are generally associated with high quality environmental amenities, namely warm weather, sunshine, unspoilt nature, clean air and water. This empirical study assessed a set of features of biodiversity, environmental quality and cultural values and their influence on the number of (domestic and international) tourists visiting a country’s coastal areas. We have attempted to assess and measure what are the determinants affecting the coastal destination (national and international) arrivals worldwide and whether environmental amenities affect tourists’ preferences for ecosystem/biodiversity and cultural goods and services consumption. The 3SLS estimations of a three equations models provided interesting results, which could be useful for discussing tourism policy implications:

1) The existence of protected areas and UNESCO cultural sites positively affects tourist arrivals.

2) Several species and habitat diversity indicators exert a significant influence on the extent of protected areas (which, in turn, affect arrivals). Domestic visitors, instead, turn out to be less influenced by the existence of marine protected areas in the destination than international tourists.

3) Climatic variables affect the existence of protected areas. In particular, (logged) annual average precipitation negatively impacts the extent of protected areas. On the other hand, average annual temperature positively affects the existence of protected areas.

4) Domestic and international arrivals positively depend on total expenditures, which, in turn positively depend on the macroeconomic milieu, indicated / denoted by the destination GDP per capita and coastal population density.

Overall, these results suggest that tourists (especially international) choose their coastal destination based on destination preference, regardless of money availability. This is an interesting result in a policy perspective that might signal that tourism policy should focus on the preservation of the environmental and cultural quality of the destination more than controlling prices. In the study, tourists show a preference for different environmental indicators, especially international tourists, whilst domestic tourism appears to be related to other motivations, probably the desire to preserve national natural heritage.

These results are particularly relevant for the southern Mediterranean countries where tourism is one of the major contributors to GDP, ranging in 2010 from 7% in Algeria to 33% in Lebanon. Accordingly, this area is also particularly vulnerable to the worsening of ecosystem/biodiversity quality driven by climate change or anthropic pressures.

In a context of policy inaction, climate change induced biodiversity loss (in our study captured indirectly by the disruption of protected areas) and the associated downturn in international arrivals in coastal areas could mean a decline in the MEDPRO reference scenario in the tourism demand that is greater than the -2% in the majority of southern Mediterranean countries, peaking to -4.5% in Tunisia. Note that these losses refer to just one limited segment of tourists (international, coastal) and quantify just the lower attractiveness of biodiversity richness. These figures should therefore be considered as just a lower bound for potential losses in the sector.

A tentative quantification of potential adaptation costs estimates the expenditure on activities addressed to biodiversity ecosystem preservation in the scrutinized areas. In terms of GDP, the conservation of protected areas and biodiversity currently entails an expenditure ranging from the 0.06% of Algeria to the 0.001% of Syria and Lebanon. The total southern Mediterranean expenditure is 0.013% of GDP. These values are then applied to the MEDPRO reference scenario.

Full protection would require quite a substantive (almost ten, thirty-fold depending on assumptions) increase in protection expenditure. This would shift the southern Mediterranean budget devoted to protected area conservation/management to 0.1%, 0.3% of GDP. The situation is quite differentiated across countries. Lebanon and Israel, for instance, seem to present current protection expenditure closer to the level offering full protection (they would need roughly to double the current financial support to protected areas and biodiversity) while other countries like Syria and Tunisia, seem much further away from this level.

These results need to be further investigated, using case-by case analytical valuation studies. There seems to be ground for further research concentrating on the demand of tourism services, specifically linked to coastal tourism. Since data are not available with the required level of accuracy for all countries, it would seem reasonable to implement such an analysis on selected countries or regions rather than at the worldwide level. In addition, our results can provide empirical hints and stimulus for a critical discussion on the ‘black box’ of consumers’ preferences, attempting to understand the underlying motivations that lie beyond the personal taste and preference structure for designing policies that are targeted to these preference structures.

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About MEDPRO

MEDPRO – Mediterranean Prospects – is a consortium of 17 highly reputed institutions from throughout the Mediterranean funded under the EU's 7th Framework Programme and coordinated by the Centre for European Policy Studies based in Brussels. At its core, MEDPRO explores the key challenges facing the countries in the Southern Mediterranean region in the coming decades. Towards this end, MEDPRO will undertake a prospective analysis, building on scenarios for regional integration and cooperation with the EU up to 2030 and on various impact assessments. A multi-disciplinary approach is taken to the research, which is organised into seven fields of study: geopolitics and governance; demography, health and ageing; management of environment and natural resources; energy and climate change mitigation; economic integration, trade, investment and sectoral analyses; financial services and capital markets; human capital, social protection, inequality and migration. By carrying out this work, MEDPRO aims to deliver a sound scientific underpinning for future policy decisions at both domestic and EU levels.

Title	MEDPRO – Prospective Analysis for the Mediterranean Region
Description	MEDPRO explores the challenges facing the countries in the South Mediterranean region in the coming decades. The project will undertake a comprehensive foresight analysis to provide a sound scientific underpinning for future policy decisions at both domestic and EU levels.
Mediterranean countries covered	Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey
Coordinator	Dr. Rym Ayadi, Centre for European Policy Studies (CEPS), rym.ayadi@ceps.eu
Consortium	Centre for European Policy Studies, **CEPS**, Belgium; Center for Social and Economic Research, **CASE**, Poland; Cyprus Center for European and International Affairs, **CCEIA**, Cyprus; Fondazione Eni Enrico Mattei, **FEEM**, Italy; Forum Euro-Méditerranéen des Instituts de Sciences Economiques, **FEMISE**, France; Faculty of Economics and Political Sciences, **FEPS**, Egypt; Istituto Affari Internazionali, **IAI**, Italy; Institute of Communication and Computer Systems, **ICCS/NTUA**, Greece; Institut Europeu de la Mediterrania, **IEMed**, Spain; Institut Marocain des Relations Internationales, **IMRI**, Morocco; Istituto di Studi per l'Integrazione dei Sistemi, **ISIS**, Italy; Institut Tunisien de la Compétitivité et des Etudes Quantitatives, **ITCEQ**, Tunisia; Mediterranean Agronomic Institute of Bari, **MAIB**, Italy; Palestine Economic Policy Research Institute, **MAS**, Palestine; Netherlands Interdisciplinary Demographic Institute, **NIDI**, Netherlands; Universidad Politecnica de Madrid, **UPM**, Spain; Centre for European Economic Research, **ZEW**, Germany
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